

ENDANGERED SPECIES

Technical Bulletin

U.S. Department of the Interior
Fish and Wildlife Service

Third Year of Sea Otter Translocation Completed in California

Galen B. Rathbun¹ and Carl T. Benz²



photo by Richard Budich

By the end of the 19th century, commercial fur hunters had largely exterminated sea otters along the California coast. In 1938, however, a small population of survivors was discovered off the Big Sur coast. It has been slowly growing, and now numbers about 1,800 animals between Point Ano Nuevo and the Santa Maria River.

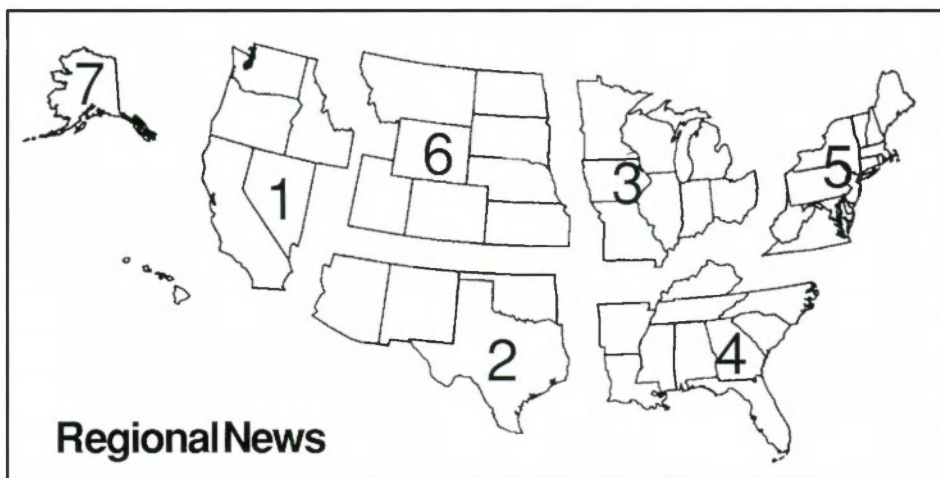
For the past 3 years, the U.S. Fish and Wildlife Service and California Department of Fish and Game have been attempting to establish an experimental population of southern sea otters (*Enhydra lutris nereis*) at San Nicolas Island, one of the Channel Islands off southern California. The objectives of the reintroduction effort are to: 1) help restore this Threatened animal; 2) obtain data for assessing sea otter capture, transport, reintro-

duction, and containment techniques; 3) gather data on sea otter population dynamics and ecological interactions with the near-shore community; and 4) study the effects on the mainland California donor population from removing animals for the translocation. (For background on the reintroduction program, see *Bulletin* Vol. XIII, No. 4.)

All sea otters taken to San Nicolas Island have been marked on the rear

flippers with a unique combination of colored tags that enable each individual to be identified visually. Most of the sea otters have also been fitted with flipper-tag radio transmitters, with a battery life of about 60 days, to enable the Service to gather information on their movements, feeding behavior, and dispersal abilities. Service biologists have done preliminary analyses of the data to gain a better

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Regional endangered species staffers have reported the following news:

Region 1 - In unrelated incidents, three Threatened northern spotted

owls (*Strix occidentalis caurina*) were found dead in northern California and Washington. All three birds were emaciated, but a necropsy examina-

tion by biologists at the Fish and Wildlife Service's National Wildlife Health Research Center in Madison, Wisconsin, revealed no explanation for their condition. The cases were referred to Service contaminant specialists for further investigation.

Another mutilated, dead spotted owl was found nailed to an information sign in December at the entrance to Olympic National Park near Port Angeles, Washington. A note also was found in which the perpetrators threatened to burn down the old growth forest in retaliation for efforts to protect the owl. The Service is investigating the incident.

* * *

The Napa County Resource Conservation District recently was awarded \$75,000 by the California Coastal Conservancy to partially fund several demonstration plots of alternative farming and viticulture (i.e., grape growing) practices in the Huichica Creek watershed. These practices will benefit the Endangered California freshwater shrimp (*Syncares pacifica*). As part of the project, up to seven different cover crop plots will be tested and monitored in vineyards along Huichica Creek; an irrigation and drainwater study will be conducted in the Robert Mondavi Winery vineyards; streambank stabilization and revegetation compatible with California freshwater shrimp habitat needs will be engineered; and a resource database will be developed.

California's impending fifth year of drought threatens the California freshwater shrimp population of Lagunitas Creek in Marin County. Without substantial late season rainfall, the Marin Municipal Water District may drain all of the water from its reservoir (which supplies the bulk of the water for Lagunitas Creek) by late 1991. If the reservoir is drained, the species will depend entirely on Samuel Taylor State Park's San Geronimo Creek, which may maintain 0.5 cubic feet per second (0.1 cubic meters per second)

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Listing Proposals — February 1991

One animal and three plants were proposed by the Fish and Wildlife Service on February 15, 1991, for listing as Endangered species. If the listing proposals are made final, Endangered Species Act protection will be extended to the following:

Point Arena Mountain Beaver *(Aplodontia rufa nigra)*

Despite its name, the mountain beaver (*Aplodontia rufa*) is not a particularly mountain-loving animal, nor is it similar in appearance to the flat-tailed rodent most people think of as the "true" beaver (*Castor canadensis*). Mountain beavers are much smaller and have only a cylindrical stump of a tail. The Point Arena form (*A. r. nigra*) can be distinguished from others by its broad, laterally compressed head, stocky body shape, and black fur.

Eight subspecies of *A. rufa* are distributed from British Columbia to central California. The Point Arena mountain beaver is the most restricted, and is known only from coastal Mendocino County, California. Because it requires cool, moist habitat, *A. r. nigra* usually occurs in gulches or on north-facing slopes within narrow coastal valleys. Although there are no reliable estimates of the subspecies' historical range, the amount of land in the region that has been converted to agricultural and urban uses makes it likely that substantial habitat has been lost.

Only 9 populations of the Point Arena mountain beaver, totalling 51-65 animals on about 100 acres (40 hectares), are known to survive. The land is in a patchwork of private, State, county, and city ownership. Livestock grazing and brush clearing already have eliminated much coastal scrub habitat in the area, and five of



photo by Jim Jokerst

Butte County meadowfoam (*Limnanthes floccosa* ssp. *californica*)

the remaining populations are on sites that are subject to continued impacts from these activities. Road construction, housing development, water diversion, the spread of exotic plants, and predation by free-roaming cats and dogs are among the other threats facing the Point Arena mountain beaver.

Butte County Meadowfoam *(Limnanthes floccosa* ssp. *californica*)

As its name suggests, this plant — a winter annual herb in the family Limnanthaceae — is known from Butte County, California. Its distri-

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Listing Proposals

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bution is limited to a narrow, 25-mile (40-kilometer) strip along the eastern flank of the Sacramento Valley from central Butte County to the northern section of the City of Chico.

The Butte County meadowfoam is restricted to vernal pools and ephemeral drainage habitat. Such seasonal wetlands are formed when an impervious subsurface layer prevents the downward percolation of fall and winter rains. Plant species found in these "amphibious ecosystems" are adapted to cycles of very wet and very dry conditions. When vernal pools and ephemeral drainages are drained or filled, their unique vegetation cannot survive.

Development in the Chico area, which is one of the two Butte County meadowfoam population centers, is the main threat to the subspecies. Two populations already have been lost to urbanization, and 11 of the remaining 14 are vulnerable. In other areas, essentially unaltered meadowfoam habitat is being turned into cropland. Twelve of the remaining populations are on privately owned lands that are subject to development or agricultural conversion. Other potential threats include overgrazing by livestock, garbage dumping, off-road vehicle use, competition from introduced plants, and poor air quality.

California already recognizes the Butte County meadowfoam as endangered according to State law. Listing it federally under the Endangered Species Act would reinforce and supplement this existing protection. For example, the Army Corp of Engineers, which is responsible under section 404 of the Clean Water Act for regulating the filling of wetlands, is required to ensure that permitted actions are not likely to jeopardize listed species.

‘Ihi‘ihi (*Marsilea villosa*)

The ‘ihi‘ihi, a Hawaiian fern, is an aquatic to semi-aquatic plant in the



‘ihi‘ihi (*Marsilea villosa*)

pepperwort family (Marsileaceae). Periodic changes in habitat moisture are necessary for the plant to complete its life cycle. Spore cases are produced as the habitat begins to dry and do not ripen until the plant is drought-stressed. When enough water is present, the species reproduces vegetatively on creeping rhizomes.

Historically found on three islands, the ‘ihi‘ihi is now apparently extirpated from Ni‘ihau. Two populations are known on the island of O‘ahu, where the species was once widespread, and a small colony was discovered several years ago on Moloka‘i. Many of the other sites that supported the species are now sugar cane fields, industrial parks, housing developments, and pastures. Naturalized exotic plants, which can out-compete native species for sunlight and water, are the main threat to the remaining ‘ihi‘ihi populations. The spread of these non-native plants is promoted by habitat disturbance from cattle grazing and off-road vehicles.

All three of the known populations are small and restricted in range. On Moloka‘i, for example, the species occupies a site approximately 7 by 25 feet (2.1 by 7.6 meters) in size on privately owned land. These plants may be vulnerable to the effects of axis deer (*Axis axis*), which have been introduced onto the island for sport hunting. The species' largest population, which is on O‘ahu at the Luahalei Naval Reservation, occurs in clumps scattered over an area of about 6 acres (2.5 hectares). This land has been leased to a private concern for cattle grazing. The third known population, also on O‘ahu, is at Koko Head on parkland owned by the City and County of Honolulu. Although this 0.5-acre (0.2-ha) site has been partially fenced through a management agreement with The Nature Conservancy of Hawaii, it remains threatened by off-road vehicles.

If *M. villosa* is listed by the Service as Endangered, the Army Corps of Engineers will be required to consider

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the species when processing applications for Clean Water Act permits, and the Department of Defense will need to evaluate the potential for jeopardy resulting from its grazing program.

Tennessee Yellow-eyed Grass (*Xyris tennesseensis*)

This herbaceous perennial, a member of the family Xyridaceae, grows in clumps that arise from a fleshy, bulb-like base. It is found in seeps or gravelly shallows along small, clean streams where soils are moist to wet year-round. Like all members of its genus, the Tennessee yellow-eyed grass inhabits sites that are thinly wooded or completely open.

Of the 10 historically known *X. tennesseensis* populations, 3 have been

lost. At least four of those that remain are declining from habitat damage associated with road construction and maintenance, logging, agricultural development, and the encroachment of woody plants. Botanists know of five populations in Tennessee and one each in Alabama and Georgia. Each site is small, encompassing less than one acre (0.4 ha), and most contain only a few hundred individuals. Except for some colonies that extend onto a State highway right-of-way in Alabama and National Park Service property (Natchez Trace Parkway) in Tennessee, all populations are on privately owned land.

Tennessee already lists the species as endangered under State law, which protects the plants but not their habitat.

* * *

Available Conservation Measures

Among the conservation benefits authorized for Threatened and Endangered plants and animals under the Endangered Species Act are: protection from adverse effects of Federal activities; restrictions on take and trafficking; the requirement for the Service to develop and carry out recovery plans; the authorization to seek land purchases or exchanges for important habitat; and Federal aid to State and Commonwealth conservation departments that have approved cooperative agreements with the Service. Listing also lends greater recognition to a species' precarious status, which encourages other conservation efforts by State and local agencies, independent organizations, and concerned individuals.

Section 7 of the Act directs Federal agencies to use their legal authorities to further the purposes of the Act by carrying out conservation programs for listed species. It also requires these agencies to ensure that any actions they fund, authorize, or carry out are not likely to jeopardize the survival of any Endangered or Threatened spe-

cies. If an agency finds that one of its activities may affect a listed species, it is required to consult with the Service on ways to avoid jeopardy. For species that are proposed for listing and for which jeopardy is found, Federal agencies are required to "confer" with the Service, although the results of such a conference are not legally binding.

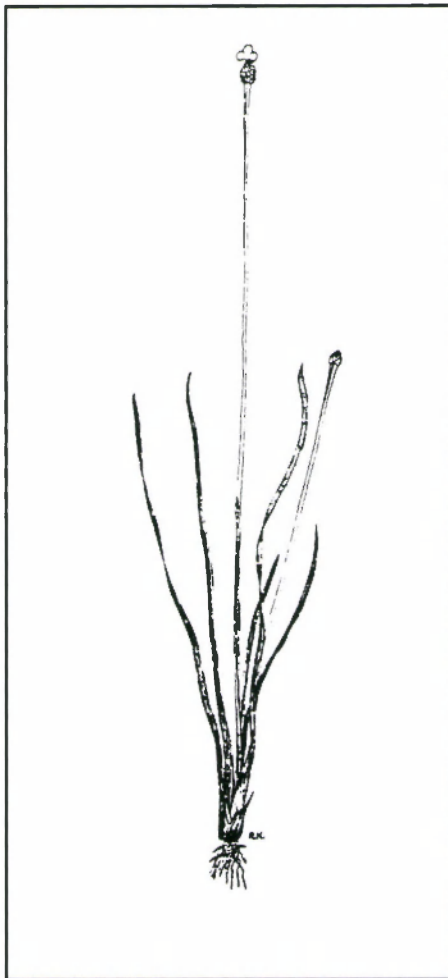
Additional protection is authorized by Section 9 of the Act, which makes it illegal to take, possess, transport, or engage in interstate or international trafficking in listed animals except by permit for certain conservation purposes. For plants, the rules regarding "take" are different. It is unlawful to collect or maliciously damage any Endangered plant on lands under Federal jurisdiction. Removing or damaging listed plants on State and private lands in knowing violation of State law or in the course of violating a State criminal trespass law also is illegal under the Act. In addition, some States have more restrictive laws of their own specifically against the take of State or federally listed plants and animals.

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summer flows to Lagunitas Creek. The California freshwater shrimp is adapted for such low stream flows. However, should Lagunitas Creek surface flows be reduced to the point where they become subgravel flows, the Service may need to take action to ensure that isolated stream pools remain habitable for the shrimp. It may also consider removing surviving shrimp to California Department of Fish and Game fish hatchery ponds until the drought breaks and stream conditions improve. Because the Golden Gate National Recreation Area is traversed by Lagunitas Creek, the Service's Sacramento Field Office and the National Park Service are investigating the prospects for water purchase to protect the California freshwater shrimp in this creek.

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drawing by Robert Kral

Tennessee yellow-eyed grass (*Xyris tennesseensis*)

Sea Otters

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understanding of translocation processes, which they hope will improve future success in reintroducing sea otters.

Results to Date

During the first 3 years of the translocation project, from August 1987 to August 1990, 139 sea otters were released at San Nicolas Island. Of the 139, 14 sea otters (10 percent), not including dependent pups, were sighted at the island in January 1991 and were behaving normally. Forty-four of the translocated sea otters (32 percent) are not at the island, but can be accounted for: 30 returned to the mainland population, 11 are known or suspected to have died, and 3 were recaptured in the no-otter management zone in southern California and returned to their original capture sites within the mainland population.

The fate of the other 81 otters (58 percent) is unknown. Some of these "missing" sea otters have probably returned to the mainland population but have not yet been sighted. Others may have returned but may never be reidentified because they lost their flipper tags. Some of the missing sea otters also probably died due to intentional and incidental take.

Clearly, these data indicate that the 5-year translocation project has not gone as well as expected. The research associated with the translocation effort, however, has helped us understand why some of the early expectations have not been realized.

Sea Otter Foraging Behavior and Movements

The foraging behavior and movements of sea otters at San Nicolas Island have been closely monitored by Service biologists. Data on foraging behavior were recorded when the animals were close enough to shore to observe. This information includes sea otter identity, dive times, prey



photo by Richard Bucio

Although sea otter numbers have been increasing, the population is still highly vulnerable to the threat of oil spills. Otters also continue to die from drowning in gill and trammel nets.

identification and number, and surface interval times. Twenty-nine sea otters observed between fall 1987 and spring 1989 successfully obtained prey on 58 percent of 586 dives. During this period, 40 percent of the sea otters' diet consisted of sea urchins (*Strongylocentrotus* spp.). Other prey included mole crabs (*Blepharipoda* spp.; 14 percent), other crabs (9 percent), abalones (*Haliotis* spp.; 4 percent), snails (3 percent), and spiny lobster (*Panulirus interruptus*; 1 percent). Some prey items were unidentified (28 percent). This information indicates that there is a suitable prey base for sea otters at the island.

To ascertain sea otter movements, biologists radio-located 42 individual otters 3 to 4 times per day between February 25, 1988, and February 2, 1989. Locations were determined to the nearest 1/4 mile (0.4 kilometer). Minimum daily distances travelled were calculated for 24 sea otters that remained at the island for 50 days after their release. The average daily distance travelled for the 24 animals was greatest during the first 10-15 days after release as they swam around the 24-mile (39-km) perimeter of the

island. The average daily distance travelled then decreased as the otters established themselves in an area used by previously-introduced otters near the west end of the island. Females moved greater distances immediately after their release and decreased their movements later than the males. No difference was found between movements of small subadults (<30 pounds or 14 kilograms) and large subadults (>30 lbs).

Sixteen of the 42 sea otters disappeared between 1 and 83 days after they were released. Seven moved erratically between the time of their release and the time of their disappearance, while nine appeared to stay in one area before suddenly disappearing. Although these data have not given any definitive answers as to what might be done to improve translocation methods, the information is still important in understanding the behavior of translocated sea otters.

A better understanding of the dispersal behavior of translocated sea otters can be achieved by looking at the fate of 100 sea otters that were successfully released at San Nicolas Island

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between August 1987 and June 1989. Nineteen of these were adult (>40 lbs; 18 kg) females, one was an adult male (>55 lbs; 25 kg), 21 were subadult (<40 lbs) males, and 59 were subadult females. As of August 1989, 37 percent of the adult females were known to have returned to the mainland population area (as did the single adult male) and 21 percent returned elsewhere along the mainland. Fourteen percent of the subadult males and 15 percent of the subadult females are also known to have returned to the mainland population. Adults remained at the island for an average of 41 days before dispersing; subadults averaged 80 days. Adults returned significantly closer to their original capture site (average = 6.3 miles; 10.1 km) than did subadults (average = 63.1 miles; 101.4 km).

These results indicate that dispersal and homing in sea otters is a major problem in maintaining the new colony at San Nicolas Island. Unfortunately, the Service has not yet been able to reduce the effects of homing

by altering translocation methods or the age-class ratios of sea otters taken to the island. The Service plans to continue its investigations of this problem.

Sea otters that disperse from San Nicolas Island must cross the "management" or "no-otter" zone that surrounds the island. When sea otters are found within this zone, the conditions of the translocation plan require that they must be removed, using non-lethal methods. Those that enter the zone from the mainland population also must be removed. Sea otters have been observed in the management zone from near the northern boundary at Point Conception, throughout most of the Channel Islands, and south to San Diego Bay. Since the translocation program began, 39 sightings of sea otters have been verified in the management zone. Thirty of these animals were alive and 9 were found dead or were reported dead but never recovered (8 of the 9 were from San Nicolas Island). Of the 30 live sea otters reported in the management zone, 7 were caught and returned to the main-

land population (3 of the 7 had left the island), while the remaining 23 were never resighted after their initial verification. Presumably, these 23 otters were mostly individuals moving through the management zone in an attempt to return home from the island. In most wildlife translocations, some dispersal from the release site is expected.

Mortality is a problem with most translocation efforts, and our experience with sea otters has been no exception. Dispersing individuals have been killed by people, accidentally drowned in fishing gear, and died due to complications caused by stress.

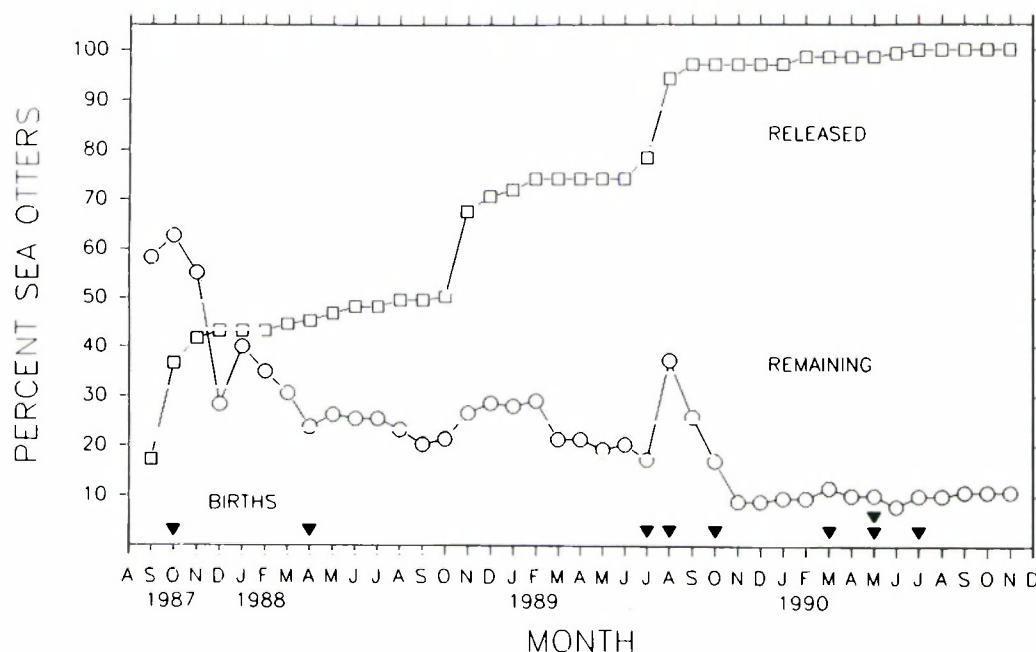
Promising Developments

There are two factors that give us hope for the eventual success of the translocation effort. First, the number of sea otters at San Nicolas Island has apparently stabilized. Since November 1989, monthly totals of sea otters identified or counted (not including dependent pups) at the island have ranged between 11 and 15 (see Figure 1). During this time, only four new

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Figure 1

SEA OTTERS TRANSLOCATED TO SAN NICOLAS ISLAND



Sea Otters

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sea otters have been released at the island. (Two of these disappeared almost immediately, while the other two have remained in the area.)

The second promising development is the recent number of births (see Figure 1). Of the nine pups born at the island since the translocation effort began, seven were born since July 1989. Six of the nine pups were likely conceived at the island. Four pups had been successfully weaned as of December 31, 1990. Biologists are not certain what happened to the other five pups, but it is likely that they died.

These demographic patterns are consistent with what is known about

other successfully translocated sea otter populations, where numbers initially declined precipitously, then stabilized and eventually began to grow as reproduction increased. The same pattern, for example, was seen in the population translocated from Alaska to the coast of Washington in 1969 and 1970. It is believed that this sea otter population decreased from 59 to less than 10 at one point. However, 212 sea otters were counted in a 1990 survey of this population.

Future of the Translocation Project

The Service will continue to monitor the translocated and mainland sea otter populations in its efforts to fulfill the objectives of the translocation

project. In addition, the Service plans to take up to 18 additional sea otters to the island during 1991-1992. These animals will be fitted with intraperitoneal radio transmitters (i.e., transmitters surgically placed within the animals' abdominal body cavity) that have an estimated battery life of 700 days. These units will allow the Service to gather additional information on the behavioral ecology of the sea otters that stay at San Nicolas Island, as well as those that disperse. The Service continues to hope that this colony will become self-sustaining.

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Staff from the Service's Ventura, California, Field Office, the Bureau of Land Management, the Army's Fort Irwin, and the California Department of Fish and Game met to discuss the Army's proposal to take approximately 150,000 acres (61,000 hectares) of high quality desert tortoise (*Gopherus agassizii*) habitat in California's western Mojave Desert. This area is also free of the upper respiratory disease syndrome, which threatens most of the tortoise's western Mojave population. The Army is proposing that the land be used for ground training of troops using tanks and artillery. Representatives from the four agencies, plus the Army Corps of Engineers and the Navy, are developing a biological assessment for the proposed land withdrawal, which will include measures to mitigate the impacts of the troops' training exercises.

* * *

Region 2 - The Service held two public meetings in February at Oatmeal and Austin, Texas, to discuss the establishment of a Balcones Canyonlands National Wildlife Ref-

uge in the Post Oak Ridge area northwest of Austin. Its purpose would be to protect approximately 35,000 acres (14,000 hectares) of high quality wildlife habitat and aid in the recovery of two Endangered birds: the black-capped vireo (*Vireo atricapillus*) and golden-cheeked warbler (*Dendroica chrysoparia*).

About 250 people showed up at the two meetings. The public comments will be used to identify issues for evaluation in an environmental assessment on establishing the refuge. The Service hopes to have a draft assessment ready for public review by the end of spring 1991.

* * *

Cowboys inspecting a fence along an Osage County, Oklahoma, ranch found the remains of 14 slaughtered bald eagles (*Haliaeetus leucocephalus*) on January 28—the largest recorded bald eagle kill in Oklahoma's history. Four bald eagle carcasses and 28 bald eagle feet, most of which were missing two talons, were found in a ditch. These birds probably were from northern States and were wintering here. About 2,000 eagles spend their winters at Oklahoma's northern streams and lakes. The Federal Gov-

ernment and several wildlife groups have offered a reward totaling \$16,500 for information leading to the arrest of those responsible for this incident. Service law enforcement agents, the Federal Bureau of Investigation, and the Oklahoma Department of Wildlife are working with the U.S. Attorney's office on the case.

* * *

Region 3 - On February 22, Dr. Ulysses S. Seal, Chairman of the Captive Breeding Specialist Group of the International Union for the Conservation of Nature and Natural Resources (IUCN), conducted a workshop at the Minnesota Zoological Garden, in Apple Valley, on a new technique for analyzing the extinction risks to small populations. Dr. Seal's approach allows biologists to rapidly evaluate critical factors for small populations in the wild, through the use of computer simulations that combine life history, distribution, and population data with estimates of disease and catastrophic events. This approach allows management agencies to identify and focus on activities that will increase the probability of a species' survival. Region 3 biologists plan to work with Dr. Seal

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Distribution and Life History of the James Spiny mussel

Mark Hove¹ and Richard Neves²



photo by Richard Neves

James spiny mussel

The James spiny mussel (*Pleurobema collina*) is one of three species of freshwater mussels in the United States with prominently spined shells. Its historic range, endemic to the James River, is believed to have extended from Richmond, Virginia, upstream throughout the larger tributaries of the upper watershed. However, a status survey on this species in 1984 documented its survival in only 5 small tributaries, an approximate 90 percent reduction in range. As a result of this decline, the James spiny mussel was listed by the Fish and Wildlife Service in 1988 as Endangered (see *Bulletin* Vol. XIII, No. 8).

The Virginia Cooperative Fish and Wildlife Research Unit at Virginia Polytechnic Institute and State University recently completed studies on the distribution of the James spiny mussel and aspects of its life history to describe reproduction, population structure, and habitat use. Much of the upper James River drainage was surveyed in the hope of discovering new populations. Qualitative mussel surveys conducted at 243 sites in 20 counties found 11 of 14 species of bivalves known to inhabit the James River drainage, including the non-native Asian clam (*Corbicula fluminea*). The James spiny mussel was found in three additional streams, and is now

known to occupy five sub-drainages in the upper watershed of the James River. The mussel resides in a variety of substrata, ranging from unconsolidated sand and silt mixtures to larger particle sizes in stable river bottoms. Flow regimes at these sites range from near stagnancy in some pools to swift water in riffles and runs.

Spawning occurs in May, and the period of gravidity in female mussels runs from late May through early August. Drift samples were collected, along with water temperature and discharge data, to determine the period when glochidia (mussel larvae) were released by females into the water. Densities of glochidia peaked from late June to mid-July, as stream discharge dropped to mean summer levels. Water temperatures increased until late June, and then stabilized near 75°F (24°C).

Suitable fish species for James spiny mussel glochidia to parasitize were identified through field sampling and laboratory experiments. Fish collected from field sites and examined for glochidia suggested that minnows, sunfish, and darters may serve as suitable hosts for this species. In the laboratory, 11 of 18 fish families found in tributaries of the upper James River were tested for suitability as fish hosts. Of the species tested, only the following cyprinids served as host: bluehead chub, rosieside dace, satinfish shiner, rosefin shiner, central stoneroller, blacknose dace, and mountain redbelly dace.

Survival and growth of juvenile mussels were compared between two groups in a laboratory experiment. One group was housed in a container with silt, and the other was placed in an identical container without silt. Juveniles of both groups were fed by giving them continuous access to a culture containing three species of

green algae, and the mussels were measured every 5 days. Growth and mortality rates of the two groups differed. Juveniles in silt grew significantly faster than those without silt. After day 18, however, the mortality rate of juveniles in the silt chamber was higher than that of the mussels in the chamber without silt. Juveniles in both containers lived about 45 days in the test and roughly doubled in length.

Valves (shells) of the James spiny mussel were collected from muskrat middens in 1987, sectioned with a jewelers saw, and examined under a microscope to determine their age at the time of death. The ages of 100 specimens ranged from 3 to 19 years, with a mean of approximately 8 years. As judged by cohort structure in the population, the mean annual mortality rate was approximately 10 percent.

Although the reasons for the decline of the James spiny mussel are unidentified, we believe that industrial and agricultural development in the James River watershed and resultant run-off have contributed to its decline. The future of the James spiny mussel likely will depend on future land use practices and water quality in these small headwater drainages. This species has relatively nonrestrictive substratum and flow requirements, and its fish hosts are common throughout the James River basin. Therefore, with improvements in water quality, we believe that remnant populations of the James spiny mussel could expand and possibly recolonize some historical habitat, and thus help to ensure the survival of this unusual species.

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²Leader, Virginia Cooperative Fish and Wildlife Research Unit, Virginia Polytechnic Institute & State University, Blacksburg, Virginia 24061

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to apply the techniques he is developing to many of the Threatened and Endangered species in the Region. For more information on this technique, contact the Captive Breeding Specialist Group at 12101 Johnny Cake Ridge Road, Apple Valley, Minnesota 55124 (telephone: 612/431-9325).

* * *

Region 5 - In February, a recovery group for the Endangered Peter's Mountain mallow (*Iliamna corei*) met in Blacksburg, Virginia, near the only known site where this plant occurs. Only three clones of the species remain in the wild. This summer, carefully controlled experimental burns will be conducted at the site to determine whether or not seed germination can be stimulated *in situ*. Recent laboratory work indicated that fire may be necessary to stimulate seed germination.

* * *

A day-long census of a previously unsurveyed graphite mine in New York, spearheaded by the New York Department of Conservation, revealed a surprising bonanza of bats. Nearly 120,000 hibernating bats were counted, making this mine the largest known concentration of hibernating bats in the East. About 100 Endangered Indiana bats (*Myotis sodalis*) were among those found at the site.

The second-largest Indiana bat hibernaculum in Region 5 is Hellhole Cave in West Virginia. (The largest for this species is another mine in New York State.) This year, 5,470 Indiana bats were counted at Hellhole Cave, the highest count since monitoring at this site was initiated.

* * *

On February 22, Certificates of Special Commendation were presented by New England Field Office and Regional Office staff to four Maine businesses in appreciation of their cooperative efforts to educate the public about Maine's endangered plants. Led by the International Paper

Company, these businesses worked closely with the State of Maine's Critical Areas Program to produce a poster entitled "Conserve Maine's Endangered Plants." The poster features the Endangered small whorled pogonia (*Isotria medeoloides*) and contains sketches of other rare plants found in Maine. This cooperative effort between government and private industry resulted in the production of 15,000 posters, a portion of which have been distributed to all of the State's junior and senior high schools. To obtain a copy of this poster, contact the Maine Critical Areas Program, SPO, State House Station 38, Augusta, Maine 04333 (telephone: 207/289-6041).

* * *

The Furbish lousewort (*Pedicularis furbishiae*), a member of the snapdragon family, was first collected in Van Buren, Maine, by Kate Furbish in 1880. It is found only on the banks of the St. John River at sites with suitable soil moisture and exposure characteristics. Due to its extremely localized distribution, its vulnerability to natural succession, human impacts, and the lack of habitat protection, the plant was listed in 1978 as Endangered. Currently, the major threats to the species appear to be physical alteration of its habitat by landowners and the potential development of hydroelectric facilities on the St. John River in Canada.

The New England Field Office recently completed a draft revised recovery plan for the Furbish lousewort. The public comment period on the draft ended March 1, and the Service expects to complete the final revised plan by June 1991. The plan calls for monitoring and managing the Furbish lousewort population, permanently protecting half of its essential habitat (through voluntary cooperation and conservation easements), and developing educational activities concerning the conservation of the species. Copies of the draft plan can be obtained from the New England Field Office,

22 Bridge Street, Concord, New Hampshire 03301-4901 (telephone: 603/225-1411; FTS 834-4411).

* * *

The New Jersey Field Office is currently investigating a clay mining operation that illegally deposited fill material on a site containing a Threatened wetland plant, the swamp pink (*Helonias bullata*), nearly destroying the population. A cease and desist order was issued by the Army Corps of Engineers for the 8 to 12 acre (3 to 5 hectare) site, but it is unknown whether or not the site can be restored to support the species. Other freshwater wetlands in New Jersey are also being degraded by siltation, changes in hydrology, and the deposition of fill materials. Consequently, the remaining swamp pink populations, almost all of which are on private land, are vulnerable.

* * *

The New York Field Office has submitted a final report on the results of a 3-year contaminant monitoring project at the Iroquois National Wildlife Refuge in western New York State. The results indicate that there are no contaminants present in either sediments or biological tissues at levels that would pose a significant threat to bald eagles breeding at the refuge. A breeding pair has successfully fledged 2 eaglets in 4 of the past 5 years.

* * *

A new site for the Endangered sandplain gerardia (*Agalinis acuta*) was discovered in Connecticut in 1990, bringing the rangewide total to 11 populations. Surveys of the other populations in 1990 indicated increases at five locations over the previous year. Decreases were noted at five of the six known locations on Long Island, New York. The Nature Conservancy and the Service's New York Field Office are planning habitat management and protective measures for several of the New York sites.

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Region 6 - At least four of the six "orphaned" gray wolf (*Canis lupus*) pups in the Ninemile Valley north of Missoula, Montana, have survived for 7 months without their parents (see *Bulletin* Vol. XV, Nos. 3 and 9). The Service initially fed the pups with white-tailed deer (*Odocoileus virginianus*) carcasses. Later, during the hunting season, they apparently lived on deer that had been killed by hunters but not retrieved. Around Christmas, the wolves made their first documented kill of a deer fawn. Since that time, they have made several other deer kills and found the carcass of an elk (*Cervus elaphus*) cow that had been killed by hunters but not retrieved. While tracking the wolves, a scent mark was found and blood was seen in the urine from one of the pups. These signal that one of the pups is coming into estrus and that mating will probably occur. While pups have bred in captivity, it has never been reported in the wild. If pups are born in late April, there probably will only be 1 or 2 and their chances for survival in the wild may not be good. However, these wolves have surprised biologists on other occasions.

The Service is working closely with ranchers in the area to emphasize the importance of proper livestock carcass disposal and quickly informing the Service of any suspected problems. If the wolves kill livestock, which are common throughout the area, the wolves will be translocated.

* * *

The second annual Montana Wolf Working Group meeting was held January 3-4 in Missoula. This group was established to coordinate wolf recovery activities in Montana, including monitoring, wolf control, research, and education and information programs. It consists of representatives of the Fish and Wildlife Service, National Park Service, Bureau of Land Management, Forest Service, Animal and Plant

Health Inspection Service, and the Blackfeet and Flathead Indian Nations. Biologists from the State of Montana, University of Montana, Idaho Fish and Game Department, and Parks Canada also attended the Missoula meeting. It was noted at the session that wolves normally will not cause a change in the movements of ungulate populations; there is no evidence that ungulates will move out of important habitats to avoid wolves. Biologists also reviewed and coordinated research techniques and methods. The Working Group is now developing a protocol for capturing and handling wolves to ensure they receive humane treatment.

* * *

Ungulate research being conducted by University of Montana graduate students has revealed some interesting preliminary findings. About 33 moose (*Alces alces*), 30 elk, and 38 white-tailed deer have been radio-tagged since fall of 1989 near Glacier National Park in the same area where several wolf packs are being monitored. As of March 1, two moose have been killed by grizzly bears (*Ursus arctos*). Three elk have been killed by mountain lions (*Felis concolor*), one by a hunter, and another by a wolf. Two deer have been killed by wolves, two by humans, one by a coyote (*Canis latrans*), one by a mountain lion, and one by a bear. These data indicate the diversity of predators in the area and the complexity of trying to sort out all the factors that may affect ungulate populations in Montana.

* * *

Region 8 - Activity patterns provide important information about animals' behavior. However, because gray wolves travel several kilometers per day, a study of their daily activity patterns has not been possible. Even radio collars that transmit activity data have not been very useful for investigations of wolf activity. The requirement that an operator or a receiving station remain near the wolf for the entire period while the animal's activ-

ity is monitored has been an insurmountable obstacle.

Dr. L. David Mech, of the Patuxent Wildlife Research Center's Minnesota Research Group, successfully tested a new type of radio collar that overcomes this problem. Ten wolves in the Superior National Forest, Minnesota, were fitted with Wildlink Recapture and Data Acquisition System collars, which can record and constantly update their activity in hourly intervals for a 24-hour period. (Mention of this trade name does not constitute endorsement by the U.S. Government.) The collar carries an activity switch and a tiny computer, which stores the activity data in the collar and transmits the most recent 24 hours of activity data to an operator upon command. The collars can transmit up to 2 miles (3 kilometers) to an operator on the ground or up to 28 miles (45 km) to an aircraft. The same collars also carry anesthetic darts that can be triggered by remote control to recapture the animal. Recapture allows the batteries in the collar to be changed, thus extending the period over which the wolf can be studied.

More comprehensive information about wolf movements may reveal whether or not wolves adjust their activity patterns to minimize contact with humans (which is often fatal to wolves), whether diseased or underweight wolves reduce activity to conserve energy, and whether wolf activity is influenced by inclement weather. For reintroduced wolves, the computerized collars allow biologists to monitor the animals' adaptation to their new surroundings.

* * *

A Threatened Aleutian Canada goose (*Branta canadensis leucopareia*), found dead in California's Sacramento Valley on November 16, 1990, was discovered by National Wildlife Health Research Center diagnosticians to have severe necrotic enterocolitis (i.e., inflammation of the colon).

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This is the first apparent case of salmonellosis in an Aleutian Canada goose.

* * *

The Offices of Scientific Authority (OSA) and Management Authority (OMA) are beginning their preliminary preparations for the eighth meeting of the Conference of Parties to the Convention on International Trade in Endangered Species of Wild Fauna and Flora (CITES), which will be held March 2-13, 1992, in Kyoto, Japan. The Service published a notice in the February 7, 1991, *Federal Register* requesting submission of species proposals to amend the CITES Appendices. For further information, please contact OSA at 4401 North Fairfax Drive, Room 725, Arlington, Virginia 22203 (telephone: 703/358-1708; FTS 921-1708).

* * *

Region 9 - In an internal reorganization, the Service's Washington Office has transferred all responsibilities for Section 7 of the Endangered Species Act from the Division of Habitat Conservation to the Division of Endangered Species. (This does not affect Regional and Field Office organization.) The Division of Endangered Species will now be handling all Section 7 policy oversight questions, major consultation issues, and nationwide consultations. It already has responsibility for implementing the pro-

BOX SCORE

LISTINGS AND RECOVERY PLANS

Category	ENDANGERED		THREATENED		LISTED SPECIES TOTAL	SPECIES WITH PLANS
	U.S.	Foreign Only	U.S.	Foreign Only		
Mammals	54	249	8	22	333	29
Birds	73	153	12	0	238	67
Reptiles	16	58	18	14	106	24
Amphibians	6	8	5	0	19	6
Fishes	53	11	33	0	97	49
Snails	4	1	6	0	11	7
Clams	37	2	2	0	41	29
Crustaceans	8	0	2	0	10	5
Insects	11	1	9	0	21	12
Arachnids	3	0	0	0	3	0
Plants	186	1	60	2	249	121
TOTAL	451	484	155	38	1128*	349**

Total U.S. Endangered

451

(265 animals, 186 plants)

Total U.S. Threatened

155

(95 animals, 60 plants)

Total U.S. Listed

606

(360 animals, 246 plants)

* Separate populations of a species that are listed both as Endangered and Threatened are tallied twice. Those species are the leopard, gray wolf, grizzly bear, bald eagle, piping plover, roseate tern, Nile crocodile, green sea turtle, and olive ridley sea turtle. For the purposes of the Endangered Species Act, the term "species" can mean a species, subspecies, or distinct vertebrate population. Several entries also represent entire genera or even families.

** There are 276 approved recovery plans. Some recovery plans cover more than one species, and a few species have separate plans covering different parts of their ranges. Recovery plans are drawn up only for listed species that occur in the United States.

Number of Cooperative Agreements signed with States and Territories:

53 fish & wildlife
39 plants

Number of Cooperative Grant Agreements signed for the African Elephant Conservation Act:

7

Number of CITES Party Nations:

110

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visions of Section 4 (listing and recovery), Section 6 (cooperative agreements and grants to States), and part of Section 10 (habitat conservation

plans for incidental take permits). The Office of Management Authority continues to have authority for issuing Section 10 permits.

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